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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/530,916	04/08/2005	Lun Kai Cheng	101137-63	9593

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EXAMINER

LYONS, MICHAEL A

ART UNIT	PAPER NUMBER
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2877

DATE MAILED: 12/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/530,916

Applicant(s)

CHENG, LUN KAI

Examiner

Michael A. Lyons

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 051305 and 090105.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Specification

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
- (e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
- (f) BACKGROUND OF THE INVENTION.
 - (1) Field of the Invention.
 - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (g) BRIEF SUMMARY OF THE INVENTION.
- (h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (i) DETAILED DESCRIPTION OF THE INVENTION.
- (j) CLAIM OR CLAIMS (commencing on a separate sheet).
- (k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

The abstract of the disclosure is objected to for reasons set forth below. Correction is required. See MPEP § 608.01(b).

The abstract of the disclosure does not commence on a separate sheet in accordance with 37 CFR 1.52(b)(4). A new abstract of the disclosure is required and must be presented on a separate sheet, apart from any other text.

Claim Objections

Claim 2 objected to because of the following informalities: the terminology used in part of the first equation is inconsistent in the claim; the equation uses both IO and I0 to define intensity. Additionally, the claims use I1 and I2 to identify intensities, while the specification uses I+ and I- to identify intensities. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As for claim 2, the claim stands as indefinite because the claim states that the phase difference is determined so that is consistent with the formulas disclosed in the claim. It is unclear how one can determine a phase difference to be consistent with an equation, as the phase difference generated by an interferometric device is dependent upon the operation and setup of the device and, in this instance, the path length differences of the first and second light paths. It is unclear as to how the phase difference can be arbitrarily determined to be consistent with a group of formulas as a result.

As for claim 5, the claim states that the calculation unit is coupled to a drive input of the path length controller to control the calculated phase difference in feedback to a desired phase difference. While changing the path length a desired amount will generate a phase change, and

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thereby a phase difference, it is unclear as to how the path length controller can directly control the calculated phase difference as claimed.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 6-7 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Regarding claims 6 and 7, although the claims are directed to a statutory class of invention, they are directed to a judicial exception; as such, pursuant to the Interim Guidelines on Patent Eligible Subject Matter (MPEP 2106), the claims must have either physical transformation and/or a useful, concrete, and tangible result. The claims fail to include transformation from one physical state to another, and although the claims appear to be useful and concrete, there does not appear to be a tangible result claimed. Merely calculating a phase difference between the light from the first and second path while eliminating an effect of a contrast between light from the first and second path would not appear to constitute a tangible result, since the outcome of the calculation step has not been used in a disclosed practical application nor made available in such a manner that its usefulness in a disclosed practical application can be realized. As such, the subject matter of the claims is not patent eligible.

Further, MPEP 2106 states, "In making this determination, the focus is not on whether the steps taken to achieve a particular result are useful, tangible, and concrete, but rather on whether the final result achieved by the claimed invention is 'useful, tangible, and concrete'".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 3-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuest ("Integrated optical Michelson-interferometer with quadrature phase demodulation in glass for displacement measuring").

Regarding claim 1, Fuest (Figs. 6, 8, and 9) discloses an apparatus for measuring an optical path length difference, the apparatus comprising optical elements in the form of lenses, a beam splitter, and a series of various reflectors that guide light from light source LD through a first path and a second path, the paths generated at a beamsplitter, an at least three-way coupler, such as shown in Figure 6, that combines light from the first and second paths with each other in at least three combinations with at least three mutually different added relative phase displacements, a detector (D1-D3 in Fig. 9) that measures interference intensities of the at least three combinations, and a calculation unit (not shown, but disclosed on page 157, column 2) that determines a phase difference between light from the first path and the second path (pages 156-157).

Fuest, however, fails to explicitly disclose the calculation unit eliminating an effect of a contrast between light from the first path and the second path.

The instant specification defines contrast as the difference between the amplitudes of the light from the first and second light paths, which essentially defines an intensity difference.

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Having light of a strong intensity interfere with light of a weaker intensity will generate an interference pattern dominated by the more intense light, leading to an inaccurate signal.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to eliminate contrast between light in the first and second path, the motivation being to provide a cleaner, more accurate interference signal and thereby a more accurate measurement with equal contributions to the measurement from both the first and second light paths. It is noted, however, that nothing in Fuest discloses the amplitude of the light in the system of Figure 9 changing as light passes through the system, leading to contrast being inherently eliminated in the device of Fuest through its normal operation.

As for claim 3, Fig. 6 shows that the light exiting the three-way coupler receives a different phase shift depending on the path the light exits, with the phase shift being 0, 120, or 240 degrees.

As for claim 4, the coupler disclosed in Fig. 6 comprises three mutually coupled waveguides (see Page 156, column 1).

As for claim 5, Fuest discloses the claimed invention as set forth regarding claim 1, and also discloses a path length controller as indicated by the arrow and Δx notation in Figure 9. However, Fuest fails to disclose the calculation unit coupled to the path length controller as a feedback unit to control the calculated phase difference in feedback to a desired phase difference. Official Notice is taken, though, as to the well known use of feedback loops in interferometry to control a device in response to a measured quantity, and it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a feedback loop in the device of Fuest to control the phase difference, the motivation being that controlling the phase

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difference to be set at a desired amount will lead to more optimal operation of the device, and thereby generate better results.

Regarding claim 6, Fuest (Figs. 6 and 8-9) discloses a method for measuring an optical path length difference, the method comprising guiding light from a light source LD through a first path and a second path defined by a group of lenses and various reflectors, combining light from the first and second path into at least three combinations with at least three mutually different added relative phase displacements with a three-way coupler as explicitly defined in Figure 6, measuring interference intensities of the at least three combinations with a series of detectors D1-D3, and calculating, with an inherent calculating unit, a phase difference between the light from the first and second path (pages 156-157).

Fuest, however, fails to disclose the calculating unit eliminating an effect of a contrast between the light from the first and second path.

The instant specification defines contrast as the difference between the amplitudes of the light from the first and second light paths, which essentially defines an intensity difference. Having light of a strong intensity interfere with light of a weaker intensity will generate an interference pattern dominated by the more intense light, leading to an inaccurate signal.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to eliminate contrast between light in the first and second path, the motivation being to provide a cleaner, more accurate interference signal and thereby a more accurate measurement with equal contributions to the measurement from both the first and second light paths. It is noted, however, that nothing in Fuest discloses the amplitude of the light

in the system of Figure 9 changing as light passes through the system, leading to contrast being inherently eliminated in the device of Fuest through its normal operation.

Regarding claim 7, Fuest (Figs. 6 and 8-9) discloses a method for comprising sampling interference intensities of at least three combinations of light from a three-way coupler of light from a first and second light path, wherein the light in the three combinations is combined with at least three mutually different added relative phase displacements (see coupler in Figure 6), and calculating a phase difference between the light from the first and second light path (pages 156-157).

Fuest, however, fails to disclose the calculation eliminating an effect of a contrast between the light from the first and second path, with the method being on a computer program product.

The instant specification defines contrast as the difference between the amplitudes of the light from the first and second light paths, which essentially defines an intensity difference. Having light of a strong intensity interfere with light of a weaker intensity will generate an interference pattern dominated by the more intense light, leading to an inaccurate signal.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to eliminate contrast between light in the first and second path, the motivation being to provide a cleaner, more accurate interference signal and thereby a more accurate measurement with equal contributions to the measurement from both the first and second light paths. It is noted, however, that nothing in Fuest discloses the amplitude of the light in the system of Figure 9 changing as light passes through the system, leading to contrast being inherently eliminated in the device of Fuest through its normal operation.

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As for the computer program product, it would have been obvious to one having ordinary skill in the art at the time the invention was made to place the method of Fuest on a computer program product for execution by a computer, the motivation being that executing the method via computer control rather than by a human operator will lead to faster measurements repeated with higher accuracy due to the structured, non-random nature of the computer program.

Allowable Subject Matter

Claim 2 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

As to claim 2, the prior art of record, taken either alone or in combination, fails to disclose or render obvious the further limitation of claim 1, wherein the intensities of the at least three combinations of light are represented by the disclosed formulae, in combination with the rest of the limitations of the above claim.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Pat. 4,728,191 to Zarobila, US Pat. 5,777,737 to Priest, and US Pat. 6,886,404 to Digonnet et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael A. Lyons whose telephone number is 571-272-2420. The examiner can normally be reached on Monday through Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley can be reached on 571-272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read "Michael A. Lyons", followed by a large, stylized circular flourish or scribble.

Michael A. Lyons
Patent Examiner
December 6, 2006